Medical Supplies, Equipments and Reagents

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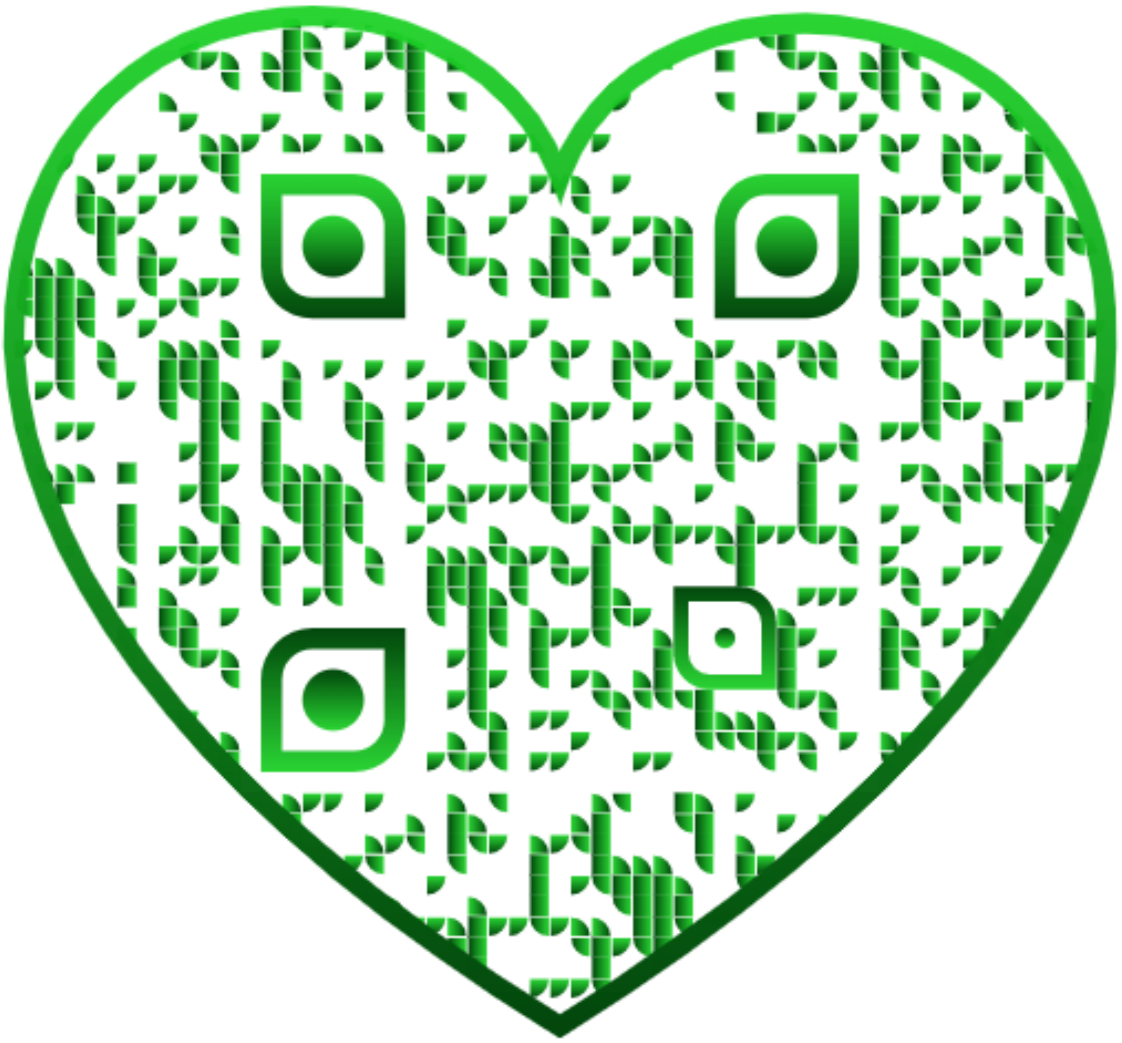


Lecture headlines

- **Introduction**
  - ✓ Medical supplies
  - ✓ Medical equipments
  - ✓ Laboratory reagents
- **Medical supplies**
  - ✓Surgical dressings
  - ✓Sutures and ligatures
  - ✓Surgical Needles
  - ✓Medical gases
  - ✓Other Medical Supplies
- **Medical Equipments/Instruments**
  - ✓Medical Imaging Equipments
  - ✓Medical Lab Equipments
  - ✓Other Miscellaneous Medical Equipments

Introduction

Definition of Terms:

- Medical equipment and supplies include a large, heterogeneous group of items

Medical supplies:

- These are bunches of items and articles utilized for various purposes including wound care (surgical dressings, sutures and ligatures), medical gases and others like Needles and syringes, Gloves, Masks, Surgical blades, Scissors, Forceps, Catheter, Nasogastric tubes, Endotracheal tubes, rectal tubes **etc...**

Medical supplies…

- Supplies comprise mainly disposable group of items (such as cotton, dressings, and disposable syringes)

Or,

- Items with relatively short life spans (such as reusable syringes or catheters)

Examples of Medical Supplies

i) Dressings

- Cotton
- Gauze
- Bandage
- Plaster of Paris (POP)
- Adhesive plaster

Examples of Medical Supplies…

ii) Sutures and surgical needles

- Sutures
  - Absorbable sutures
  - Non absorbable sutures
- Surgical needles

iii) Catheters, tubes and drains

- Catheters
- Nasogastric tube
- Rectal tube
- Endotracheal tube
- Tracheotomy tube
- Airway suction tube
- Thoracic drain
- Urine bag
- Colostomy bag
- Lubricating jelly (KY jelly)

Examples of Medical Supplies…

iv) Injectable supplies

- Syringes
- Scalp vein needles
- IV Canula
- IV giving set
- Blood bag
- Blood collecting set

Examples of Medical Supplies…

v) X-ray supplies

- X-ray films
- X-ray cassettes
- X-ray intensifying screens
- X-ray hanger

vi) Linen and operating field supplies

- Apron
- Surgical cap
- Face mask
- Surgical trouser and shirt
- Surgical protective glasses

Examples of Medical Supplies…

vii) Other supplies

- Surgical blade
- Tongue depressor
- Tourniquet
- Cord clamp/cord tie
- Gloves
  - Surgical glove
  - Examination glove

Medical equipment

- Any instrument, apparatus, machine, implant or calibrator, material or other similar or related article that is used for diagnosis, prevention, monitoring, treatment, or alleviation of disease or injury

Medical equipment…

- Can also be defined as any health care instruments which do not achieve any of their principal intended purposes by chemical action in or on the body or by being metabolized
- These devices are usually designed with rigorous safety standards

Medical equipment…

- The term equipment encompasses both,
  - **Capital equipment:** Long-lasting, durable goods such as autoclaves
  - **Recurrent equipment:** Items with short life spans such as thermometers and sphygmomanometers

There are several basic types of medical equipment:

- Diagnostic equipment: Medical imaging machines used to aid in diagnosis

  - **Eg:** Ultrasound and magnetic resonance imaging (MRI) machines, positron emission tomography (PET) and computed tomography (CT) scanners, and x-ray machines

Medical equipment…

There are several basic types of medical equipment:

- Therapeutic equipment: Infusion pumps, medical lasers and surgical machines

Medical equipment…

- Life support equipment: Used to *maintain* a patient's bodily function

  - **Eg:** Medical ventilators, anaesthetic machines, heart-lung machines and dialysis machines

Medical equipment…

- Medical monitors: Used to measure a patient's medical state

  - Monitors may measure patient vital signs and other parameters including ECG, EEG, blood pressure, and dissolved gases in the blood

Medical equipment…

- Medical laboratory equipment automates or helps analyze blood, urine and genes

Medical equipment…

- A biomedical equipment technician (BMET) is a vital component of the healthcare delivery system

  - Employed primarily by hospitals, BMETs are the people responsible for maintaining a facility's medical equipment

Laboratory Reagents:

- Defined as chemicals and biological agents used in laboratory testing for detecting or measuring analyt
- Laboratory Reagents can be either liquid or solid in physical states

Medical supplies

1. Surgical Dressings

- Surgical dressing is a term applied to a wide range of materials used for dressing wounds, or injured or diseased tissues

➢ They are used as **coverings**, **absorbents**, **protective** or **support** for injured or diseased tissues (parts)

Surgical Dressings…

Dressing may serve to:

- Provide an moist environment for wound healing
  - ✓Desiccation of a wound is a major factor in retarding wound healing
  - ✓Increases scaring
- Prevent maceration by permitting evaporation or absorption
  - ✓In highly exudative wounds, excessive moisture and autolytic enzymes will damage repairing tissue
  - ✓Provide a perfect culture medium for microbes

Surgical Dressings…

Dressing may serve to,

- Promote healing
- Protect the wound from further damage
- Reduce odor
- Provide support
- Reduce pain and increase patient comfort
- Reduce overall cost associated with wound treatment
- Control microbial growth (with anti-microbials)

Surgical Dressings…

Classification

1) Primary dressing

- Directly placed on a wound surface
- Usually reinforced by materials of various types to absorb the wound secretion
- Provide absorptive capacity
- May prevent desiccation and infection
- Prevent adhesion of the secondary dressing to the wound

  E.g. Plain guaze, impregnated guaze, film dressings, etc.

Primary dressing…

Primary dressing

Surgical dressings….

- Examples of primary dressings include:

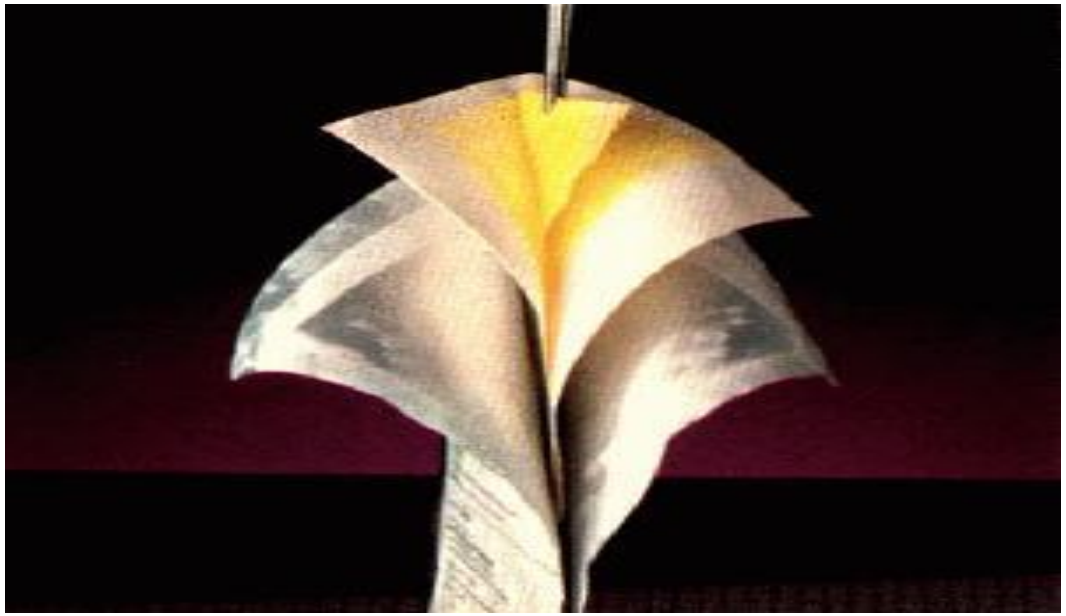
A. **Plain Gauze:**

- It sticks to wounds

Surgical dressings….

B. Impregnated Gauze:

- Reduced adherence to wounds
- Cotton, rayon or cellulose acetate gauze has been impregnated with substances like paraffin, KY jelly or sodium chloride



Surgical dressings….

Impregnated Gauze…

- A secondary dressing should be used with these dressings

✓To prevent desiccation, provide absorbency and prevent entrance of pathogens

- Together with an appropriate secondary dressing, these dressings can be used in heavily exudating wounds

Surgical dressings….

C. Film Dressings:

- Transparent film
- Made of films of polyuriethane with **acrylic** or **polyether** adhesives
- Semipermeable membrane to water vapor and oxygen and yet are waterproof
- Permits bathing and observation of the wound
- In lightly exuding wounds, they permit enough evaporation to promote moist wound healing and prevent maceration

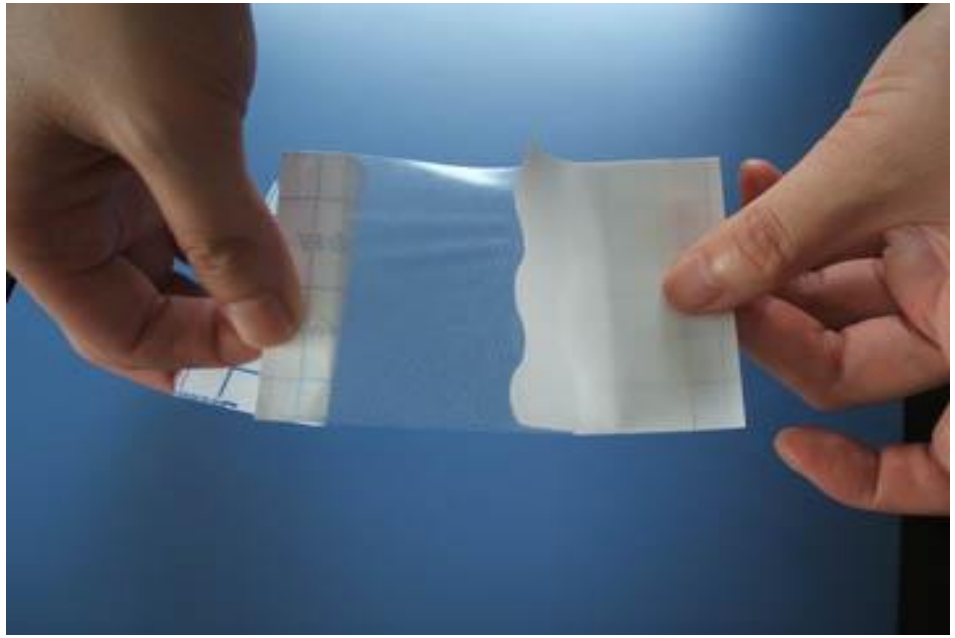
Surgical dressings….

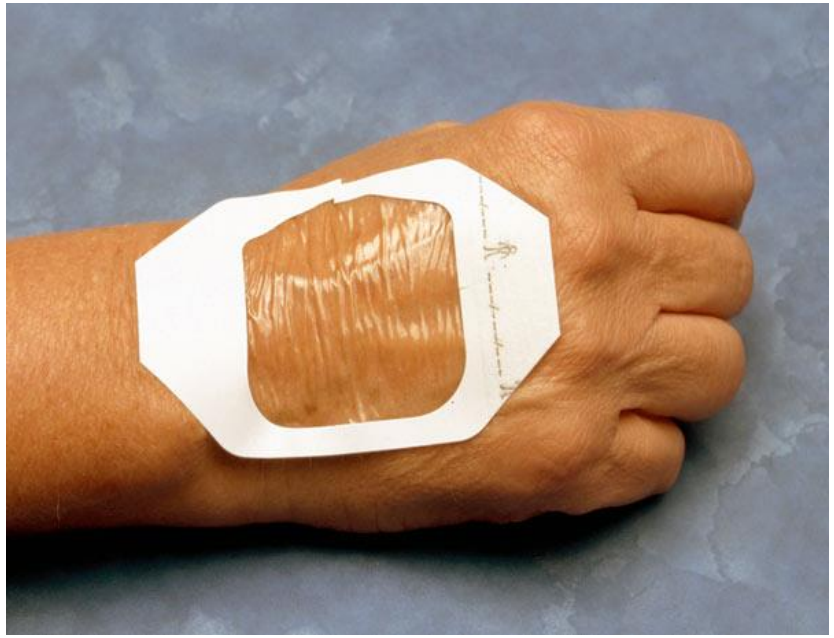
Film Dressings…

- Should not be used in infected or heavily exuding wounds

✓They may wrinkle, forming channels for microbial entrance

✓Poor absorptive capacity





Surgical Dressings…

2) Secondary dressing:

- Placed over a primary dressing
- Provide further protection, absorptive capacity, compression (firmness)

  E.g. Absorbents (surgical cotton, surgical guazes, etc), bandages etc.

- ***Some dressings are solely primary or secondary in nature, others have the characteristics of both***

Surgical Dressings…

Secondary dressing

Surgical dressings….

Examples of secondary dressings include:

I. **Absorbents:**

A. Surgical cotton:

- Absorbent cotton is a practically pure, white cellulose fiber
- Natural wax, oils and impurities removed from it
- It absorbs water readily
- The official purified surgical cotton USP is the basic surgical absorbent cotton
- Its absorbency may decrease by prolonged storage, moisture, heat, dust

Surgical dressings….

Uses:

- Absorbing wound exudates
- Cleansing wounds, applying bactericidal solution to the skin before surgery and in obstetrics

Surgical dressings….

b. Surgical gauze:

- It is a soft cotton cloth of plain weave
- Used to provide an **absorbent material** of sufficient tensile **strength** for surgical dressings
- It is also known as "Absorbent Gauze USP"
- Classified based on its mesh or number of threads per inch
- The closer-meshed gauze is required for extra strength and greater protection

Surgical dressings….

II. Bandages

- A **bandage** is a piece of material used either to **support a medical device** such as a dressing or splint, or on its own to provide **support to the body**
- Used to hold dressings in place by providing support or pressure
- Could be elastic or inelastic or become rigid after shaping for immobilization

Surgical dressings….

Function:

- To retain dressings in place
- To provide support and or compression for injuries
- To apply a medicated paste directly to the skin surface

Surgical dressings….

Classification of bandages

1. **Non-elastic**
2. **Elastic**
3. **Impregnated**
4. **Adhesive**

Surgical dressings….

i) Non-elastic bandage (non-stretch)

E.g. Triangular bandages

- Is a piece of unbleached bandage with a shape of right angled isosceles triangle

Use: It is used as a sling and should be sterile if in contact with broken skin

Surgical dressings….

Fig. Triangular bandages

Surgical dressings….

ii) Elastic bandages

Examples:

a) *Elasticity produced by twisting threads*

E.g. Crepe bandage

- ✓ This is best known elastic bandage
- ✓ The warp threads are of cotton and wool

Surgical dressings….

Use: The elasticity of Crepe bandages make it suitable for bandaging varicose veins, sprains, etc.

- Because it conforms closely to the skin for joint surface and allows limited motion and stretches in case of swelling so that circulation is not impaired

Surgical dressings….

Fig. Cotton Crepe Bandage B.P

Surgical dressings….

b) *Elasticity produced by rubber threads*

E.g. Cotton and rubber elastic bandage

- ✓ This bandage has a cotton weft but the warp contains rubber threads in the repeated arrangement

Use: As for crepe bandage

Surgical dressings….

iii) Impregnated bandage

Examples:

- **Plaster of Paris bandage (p.o.p).**
  - ✓This is a cotton cloth impregnated with suitable adhesive such as methyl cellulose of high methoxy content and hypermelose
  - ✓In use it is thoroughly moistened with water and applied to the limb or body

Surgical dressings….

Use:

✓For immobilization and splinting of fractures (in orthopedics)

Surgical dressings….

iv) Adhesive bandages:

- Adhesive bandages are more suitable for treating ambulant patient because of the elasticity:-
  - ✓ Provide excellent support for the affected regions
  - ✓ Ensure that the bandage is not unduly restrictive.

- *The major difference between an adhesive and an impregnated bandage is that the former has an elastic fabric which is spread with an adhesive mass*

Surgical dressings….

British Pharmaceutical Codex classification

- According to **B.P.C** the types of surgical dressing are:
  - Fibers
  - Fabrics
  - Bandages
  - Self-adhesive plasters
  - Compound dressings

Surgical dressings….

Fiber Vs. Fabric

Fiber

- Fiber is a hair like strand of material
- A fiber is the smallest visible unit of any textile product
- It is a substance that is extremely long in relation to its width, at least 100 times longer than it is wide
- Fibers are flexible and may be spun and made into **fabrics**

Surgical dressings….

Fabric

- ✓Is a cloth material made by weaving or knitting threads together

Surgical dressings….

1. Fibers

- Cotton is by far the most useful fiber for surgical dressings but regenerated cellulose, wood fibers and wool are also used

Some examples of fibers:

i. **Absorbent cotton**

Surgical dressings….

ii. Capsicum cotton wool (capsicum cotton)

- This is absorbent cotton wool that has been medicated by pouring over it an alcoholic solution of capsicum oleoresin, methyl salicylate and suitable (usually orange brown) dye

Uses:

- Capsicum oleoresin has a rubifacient action
- Methyl salicylate with analgesic action
- It must not be used on broken skin in which it causes an intense burning sensation

Surgical dressings….

iii. Regenerated cellulose (Rayon):

- Rayon is generally made from wood cellulose

Use: May be used to replace cotton

- Cleaning and medicating wound
- Compared with cotton, rayon is cheaper, cleaner, and softer

2.Fabrics

Some examples of fabrics:

i) Absorbent cotton gauze (Absorbent gauze, Gauze, unmedicated gauze)

- This is a soft cotton cloth of plain weave, open texture
- It is usually 90 cm wide, folded length wise and in various lengths

Use:-

- Can be applied directly to wounds and is the most important dressing for this purpose
- In general used after surgery, for draining exudates from large wounds

Fabrics…

ii) Absorbent Ribbon gauze (unmedicated Ribbon gauze)

- This is similar to absorbent gauze but its texture is closer and finer

Uses:

- Absorb exudates; provide means of removing exudates, Pus etc…
  - ✓Ribbon gauze is particularly convenient for packing dental socket

Fabrics…

iii) Gauze pad (Absorbent gauze pad)

- This is absorbent gauze folded in to a square pad
- The gauze may be dyed with a harmless dye
- The number of layer and the dimension of the pad vary according to use, but the common sizes are 5/7.5 and 10 cm squares, available in 8, 12, 16 or 32

Use: Small gauze pads are a convent size for swabbing and are often used for this purpose, especially during surgery

Fabrics…

IV) Impregnated fabrics

A. Oiled silk: This is a silk fabric of plain weave made evenly **water proof** by treatment with drying oils or oil-modified synthetic resins

- It may be colored

Use:-

a) To cover wet dressings to keep them moist

b) To protect clothing from dressings

Fabrics…

b) Paraffin gauze dressing

- This is a sterile dressing consisting of pieces of cotton, rayon or cotton and Ryon gauze packed in a suitable container and impregnated with yellow soft parafin

Use:-

- Is used in skin grafting and for treating burns and other wounds
- Prevent adherence to the tissues
- The open nature of the gauze allows air to reach the wound and to drain away

Reading assignment

- ✓ Read about self adhesive plasters & compound dressings

Surgical Dressings...

Features of an ideal dressings

- ✓ Porous to water vapor
- ✓ Capable of absorbing excess secretions
- ✓ Non-adherent to granulating surfaces
- ✓ Free from substances that cause tissue reactions
- ✓ Impervious to micro organisms
- ✓ Impervious to fluid from out side
- ✓ Satisfactory tensile strength
- ✓ Constant physical properties under normal conditions
- ✓ Capable of being sterilized by conventional means
- ✓ Inexpensive

Surgical Dressings...

Standards:

Standards for dressing

- ✓Sterility (if applicable)
- ✓The number of thread per specified length
- ✓The weight of a specified area

Other tests which are necessary to confirm major properties include

- ✓Absorbency
- ✓Elasticity
- ✓Water proofness
- ✓Water vapor permeability
- ✓Adhesiveness

2. Sutures and Ligatures

Definition

- A surgical suture is a strand or fiber used to hold wound edges in position during healing and the process of applying such a strand is called **suturing**
- There are numerous suture materials available and the choice depends on the task it is required for, the healing characteristics and the surgeon's preferences (training)
- *They generally consist of a needle with an attached length of thread*

Sutures and Ligatures…

- When such material, with out needle, is used to stop bleeding by tying off blood vessels, the strand is called a **ligature**, and the process is known as **ligating**

Sutures and Ligatures...

A wound before and after suture closure

Sutures and Ligatures...

Characteristics of suture materials:

- The ideal suture has the following characteristics:
  - ✓ It must be sterile
  - ✓ All-purpose (any surgical procedure)
  - ✓ Causes no (minimal) tissue injury, irritation or reactivity
  - ✓ Easy to handle and to knot
  - ✓ Hold securely when knotted
  - ✓ Adequate tensile strength
  - ✓ Favorable absorption profile
  - ✓ Resistant to infection

Sutures and Ligatures...

- **N.B.** As no single material provides all these features, in different situations and with differences in tissue composition through out the body, the requirements for adequate wound closure requires different suture characteristics

Classification of sutures…

- There are many kinds of sutures, with different properties suitable for various uses
- Suture materials may be divided in to
    i. Natural suture
    ii. Synthetic sutures

Or

    i. Absorbable
    ii. Non-absorbable

Classification of sutures…

Natural *Vs* synthetic

- Sutures are made from both man-made and natural materials
- Natural suture materials include **silk**, and **catgut**
  - ✓Catgut:- Made from the dried and treated intestine of a cow, sheep or goat
- Synthetic sutures are made from a variety of textiles such as **nylon** or **polyester**, formulated specifically for surgical use

Classification of sutures…

I. Absorbable surgical suture

- Are threads or strand of materials which are digested by body enzymes or hydrolyzed by tissue fluids in which they are embedded during and after the healing process

- Absorbable sutures are designed to break down over **a specific time frame** and be absorbed by the body

Absorbable sutures…

- It degrades as a wound or incision heals
- *They are used when temporary support is required and the healing tissue will eventually support itself*

Absorption occurs by:

- Phagocytosis and proteolysis in natural suture
- Hydrolysis in synthetic suture

Absorbable sutures…

- The most common absorbable sutures available in the market include:
  - **Surgical gut**
  - **Polyglycolic acid**
  - **Chromic suture materials**

Absorbable sutures…

1. **Surgical gut:** derived from the small intestine of healthy dried and treated intestine of a cow, sheep or goat

   ✓ It is uniformly fine-grained and possesses great tensile strength and elasticity

2. **Dexon (Polyglycolic acid)**: wide spread absorbable suture material of synthetic origin

   - Dexon has low rate of reactivity and infection rate with excellent knot security and tensile strength

Absorbable sutures…

3. **Chromic suture material**: these are suture materials that have undergone various intensities of tanning with salt of chromic acid to delay the tissue absorption time

Typical examples of chromic suture and absorption times include:

- Type A: Plain, 10 days
- Type B: Mild chromic, 20 days
- Type C: Medium chromic, 30 days
- Type D: Extra chromic, 40 days

II. Non absorbable sutures

- Suture materials that cannot be absorbed by body cells or fluids
  - ✓ Suture resists the body's attempt to dissolve it
- A strand of materials that are suitably resistant to the action of living mammalian tissue

Non absorbable sutures…

- Non-absorbable sutures are designed to either be left permanently in the body or are to be removed by a surgeon after a surface incision heals

✓Permanently placed, non-absorbable sutures are generally used in tissue where even though healing may occur; the new tissue may never have the needed strength to support itself

✓The effective tensile strength of such sutures remains high over time

Non absorbable sutures…

- They include the following:
  - Silk
  - Nylon
  - Polyester
  - Prolene **(polyproplene polymer)**
  - Stainless steel wire

Suture sizes

- Currently, two standards are used to describe the size of suture materials; USP and EP
- USP standard is more commonly used.
  - ✓ In the USP standard the size is represented by a combination of two Arabic numerals for sizes less than 0: a 0 and any number other than 0, like 2-0 or 2/0=00**, 3-0 or 3/0=000**

✓ The higher the first number, the smaller the suture material

- 2/0 **>3/0…..**

✓ Size greater than 0 are denoted by 1, 2, 3 etc

- Sizes increases with these numbers, size #1 <2<3….

✓ This standard size also varies with the type of suture material

USP Size codes		EP Size codes	Suture Diameter (MM)	
Non synthetic absorbable materials	Non absorbable and synthetic absorbable materials	Absorbable and Non absorbable materials	Min	Max
	11/0	0.1	0.01	0.019
	10/0	0.2	0.02	0.029
	9/0	0.3	0.03	0.039
	8/0	0.4	0.04	0.049
8/0	7/0	0.5	0.05	0.069
7/0	6/0	0.7	0.07	0.099
6/0	5/0	1	0.10	0.14
5/0	4/0	1.5	0.15	0.19
4/0	3/0	2	0.20	0.24
3/0	2/0	2.5	0.25	0.29
2/0	0	3	0.30	0.39
0	1	4	0.40	0.49
1	2	5	0.50	0.59
2	3	6	0.60	0.69
3	4	7	0.70	0.79
4	5	8	0.80	0.89
5	6	9	0.90	0.90
6	7	10	1.00	1.09

Example

Description of items	Unit	Unit price	
		Sweco	Orient
Catgut chromic gauge 3(2/0) 75cm on 25-27mm ½ circle round Bodied needle	Dozen	121.31	17.76
Polyglycolic acid absorbable No. (2/0), braided violet 75 cm on 27mm ½ circle R.cutting 4705.	Dozen	216.72	
Poly amide Monofilament gauge .3(9/0), 38 cm on 6-6.4mm curved needle.	Dozen	586.10	97.46

Sutures...

- Modern sutures available on the market range from heavy (thick) braided suture for orthopedics purpose to too fine (thin) monofilament suture for ophthalmic use

- N.B. Traumatic needles are manufactured in all shapes for most suture sizes

Suture indication by location

- Generally the smallest suture that adequately holds the healing wound edges

✓ Optimal suture size is usually the smallest size necessary to achieve the desired tension-free closure

✓ The tensile strength of the suture should not exceed the tensile strength of the tissue

✓ If wound tension is high, small diameter sutures may injure tissues by cutting through them

- Hence, size selection should closely match the tensile strength of the suture and tissue

Suture indication by location

- Multifilament sutures are more likely to harbor contaminants than monofilament sutures

  ✓So monofilament sutures are generally preferable in potentially contaminated tissue

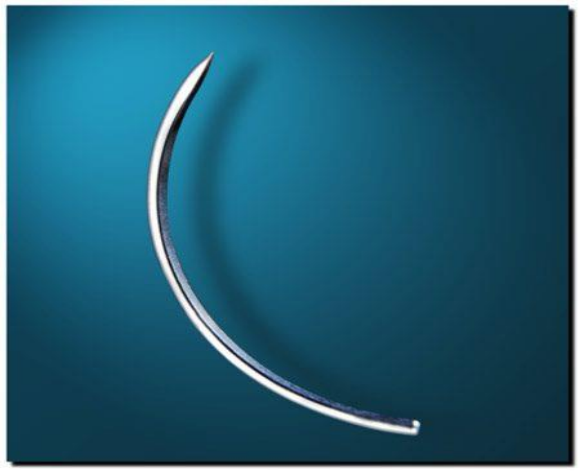
Recommended suture sizes Vs wound area (location)

Wound area/s	Suture type/s
Mucosal lacerations (mouth, tongue, genitalia)	Absorbable 3-0 or 4-0
Chest, back, abdomen, extremities	Superficial non-absorbable 4-0 or 5-0 Deep absorbable 3-0 or 4-0
Face, eyebrow, nose, lip	Superficial non-absorbable 6-0 Deep absorbable 5-0
Ear, eyelid	Superficial non-absorbable 6-0
Hand	Superficial non-absorbable 5-0 Deep absorbable 4-0
Penis	Superficial non-absorbable 5-0 or 6-0

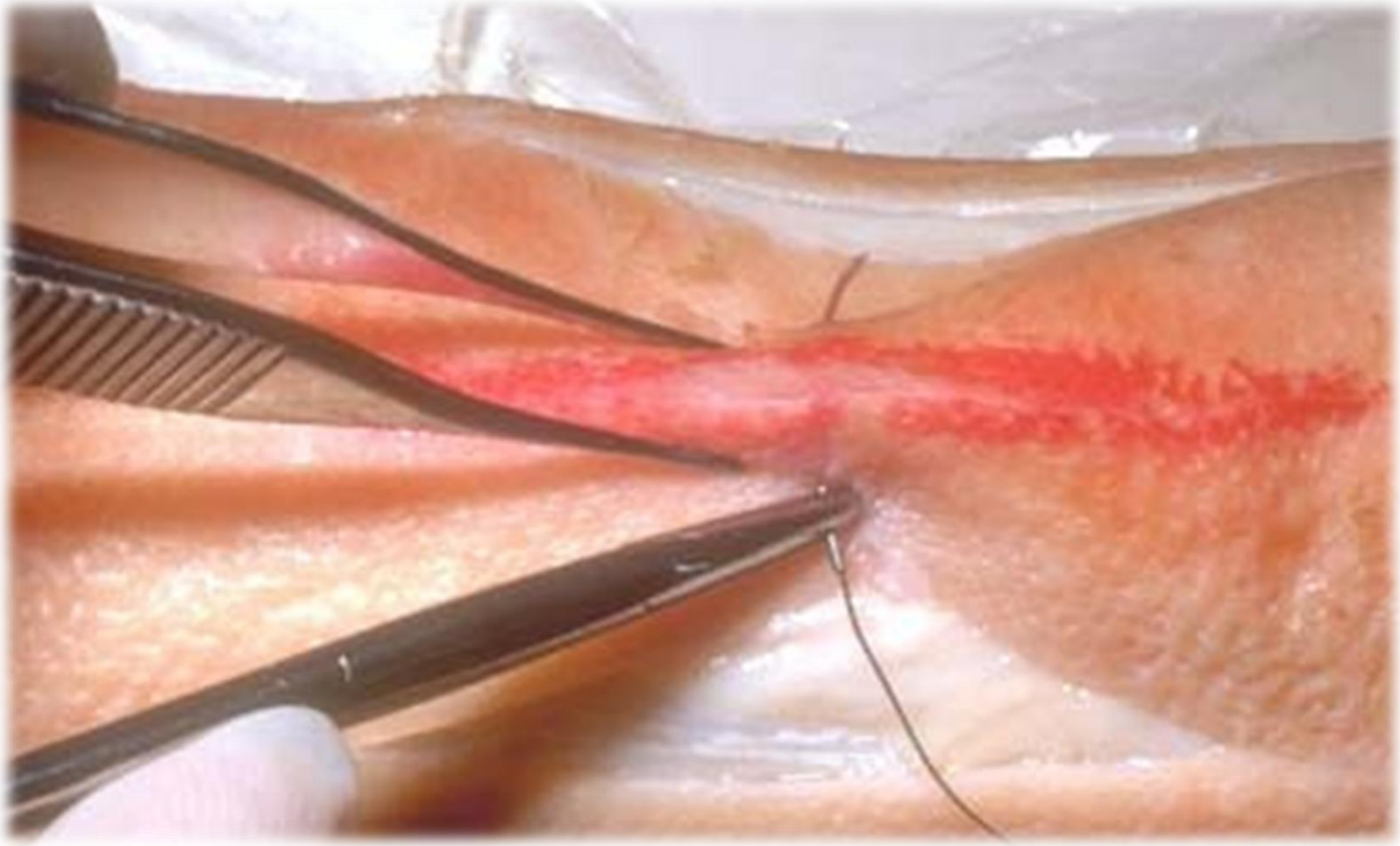
Surgical Needles

Surgical Needles:

- Are needles with varying sizes and shapes for wound closure (suturing)
- Produced from stainless steel alloys which have excellent resistance to corrosion
- Wound closure and healing is affected by the initial tissue injury caused by needle penetration and subsequent suture passage



Needles for surgical sutures…



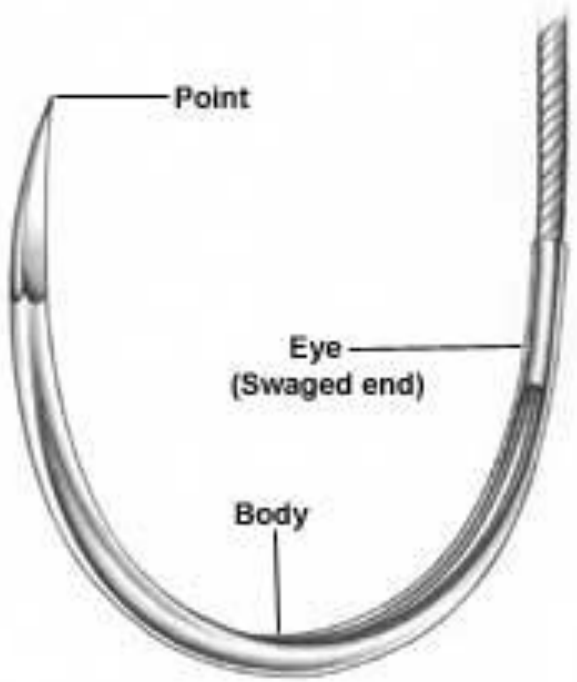
Needles for surgical sutures…

Suturing material and needle holders

Needles for surgical sutures

- Regardless of its intended use, every surgical needle has three basic components:
  - ✓The **eye (swag)**
  - ✓The **body**
  - ✓The **point**

Needles for surgical sutures…



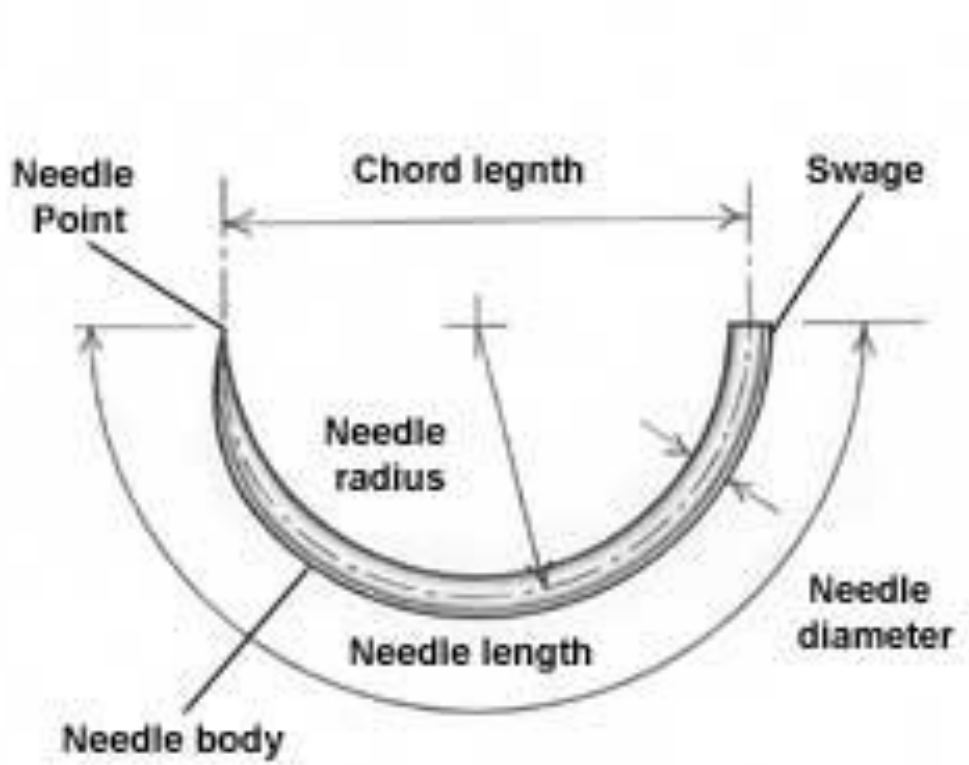


Fig.The surgical needle

Needles for surgical sutures…

Measurements

- The following measurements determine the size of a needle.

✓ **CHORD LENGTH-** The straight line distance from the point of a curved needle to the swage

✓ **NEEDLE LENGTH-** The distance measured along the needle itself from point to end

✓ **RADIUS-** The distance from the center of the circle to the body of the needle if the curvature of the needle were continued to make a full circle

✓ **DIAMETER-** The gauge or thickness of the needle wire

Types of needles…

1. Based on shape of the body

- There are several shapes of surgical needles, including:
  - ✓Straight
  - ✓Half curved or ski
  - ✓1/4 circle
  - ✓3/8 circle
  - ✓5/8 circle

Types…

2. Traumatic *Vs* atraumatic needles

Traumatic needles

- ✓ Are needles with holes or eyes which are supplied to the hospital separate from their suture thread
- ✓ The suture must be threaded on site, as is done when sewing at home

Traumatic Vs atraumatic needles…

Suturing material and needle holders

Needles for surgical sutures…

Atraumatic needles with sutures

- ✓Comprise an eyeless needle attached to a specific length of suture thread
- ✓The suture manufacturer swages the suture thread to the eyeless atraumatic needle at the factory

Atraumatic needles with sutures…

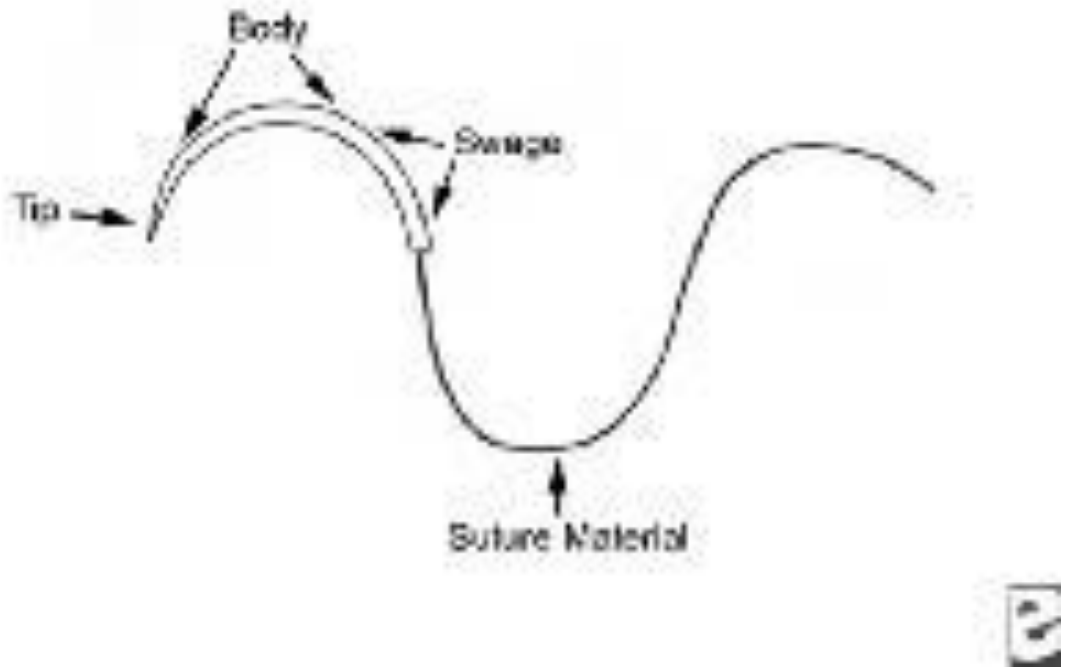


Fig. Atraumatic needles with sutures

Atraumatic needles with sutures…

- There are several advantages to have the needle pre-mounted on the suture
  - ✓ The doctor, the nurse, etc. does not have to spend time threading the suture on the needle
  - ✓ More importantly, the suture end of a swaged needle is smaller than the needle body
  - In traumatic needles with eyes, the thread comes out of the needle's hole on both sides
  - When passing through the tissues, this type of suture rips the tissue to a certain extent, thus the name *traumatic*
- Nearly all modern sutures feature swaged atraumatic needles

Needles for surgical sutures…

3. Point types:

A. Cutting type:

- ✓The needle has at least 2 opposing cutting edges and designed for penetration through dense, irregular and thick tissues

- Conventional cutting: the needle has 3 cutting edges (triangular cross-section) where the third cutting edge is on the inner concave curvature

Needles for surgical sutures…

- Reverse cutting: the 3rd cutting edge is on the outer convex curvature of the needle and designed for tissues that are tough to penetrate
- It has reduced risk of cutting out tissue

B. Taper point (round needle):

✓This type of needle penetrate and passes through tissues by stretching with out cutting

Surgical Needles…

Ideal surgical needle characteristics

- ✓ High quality stainless steel
- ✓ Smallest diameter possible
- ✓ Stable in the grasp of the holder
- ✓ Capable of implanting suture material with minimal trauma
- ✓ Sharp enough to penetrate tissue with minimal resistance
- ✓ Sterile and corrosion resistant

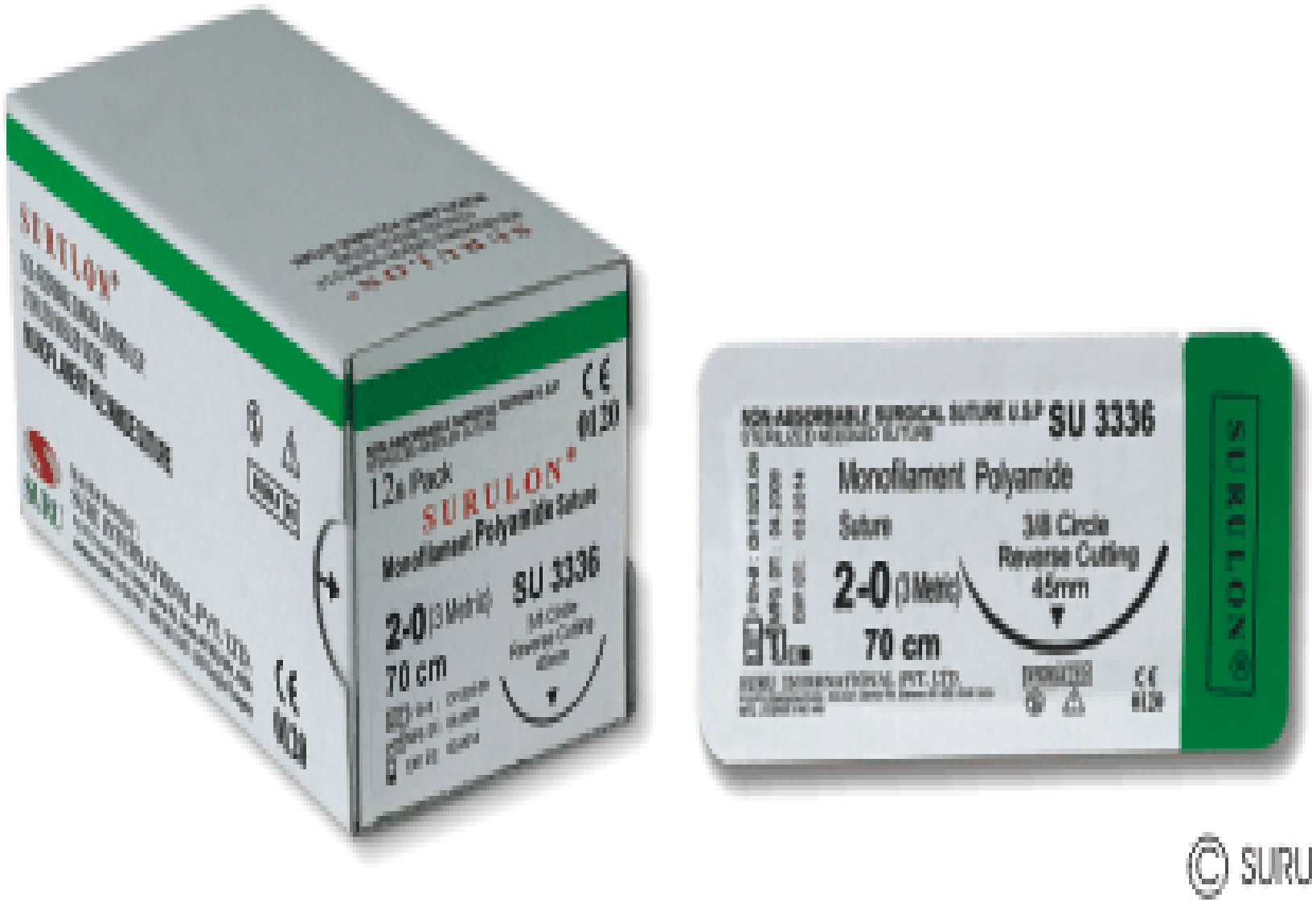
Suture removal timing

- ✓Times will vary according to the location and depth of the wound
- ✓However, the average time frame is 7-10 days after application
- ✓The following general rules can be used in deciding when to remove sutures:
  - Scalp: 6-8 days
  - Face, Eyelid, Eyebrow, Nose, Lip: 3-5 days
  - Ear: 10-14 days
  - Chest and abdomen: 8-10 days
  - Back: 12-14 days
  - Extremities: 12-14 days
  - Hand: 10-14 days

Labeling

- **The label on sutures must state**
  - ✓ The length of the strand
  - ✓ the gauge number
  - ✓ For single use only
  - ✓ Needle length, curvature
  - ✓ Lot number
  - ✓ Manufacture date
  - ✓ Expiry date
  - ✓ Sterilization method
  - ✓ Storage instructions
  - ✓ Manufacturers Name & Address

Labeling…


SURULON
SURULON
12 Pack
Monofilament Polyamide Suture
SU 3336
2-0 (3 Metric)
70 cm
NON-ABSORBABLE SURGICAL SUTURE U.S.P.
SU 3336
Monofilament Polyamide
Suture
3/8 Circle
Reverse Cutting
45mm
2-0 (3 Metric)
70 cm
SURULON
© SURU

Pharmaceuticals Fund and Supply Agency (PFSA)

List of Suturing materials for National procurement

Description of items	Unit	
Catgut chromic gauge 2.0(4/0) 75cm on 17 -19 mm ½ circle Cutting Needle	Dozen	
Catgut chromic gauge 2.0(4/0)75cm on 14 -16 mm ½ circle round Bodied Needle	Dozen	
Catgut chromic gauge 3.0(3/0) 75cm on 18-20mm ½ circle Round Bodied Needle	Dozen	
Catgut chromic gauge 3.0(3/0) 75cm on 30-32mm ½ circle Round Bodied Needle	Dozen	
Catgut chromic gauge 3.5(2/0) 75cm on 25-27mm ½ circle round Bodied needle	Dozen	
Catgut chromic gauge 3.5(2/0) 75cm on 38-40mm ½ circle round Bodied Heavy needle	Dozen	
Catgut chromic gauge 3.5(2/0) 75cm on 45mm ½ circle round Bodied Heavy needle	Dozen	

8	**Catgut chromic gauge 4.0(0) 75cm on 30-32mm ½ circle round Bodied Needle**	**Dozen**
9	**Catgut chromic gauge 4.0(0) 75cm on 37-40mm ½ circle round Bodied Needle**	**Dozen**
10	**Catgut chromic gauge 5.0(1) 75cm on 38-40mm ½ circle round Bodied Heavy needle**	**Dozen**
11	**Catgut chromic gauge 5.0(1) 75cm on 48-50mm ½ circle round Bodied Heavy needle**	**Dozen**
12	**Catgut chromic gauge 6.0 (2) 75cm on 45mm ½ circle round Bodied Heavy needle**	**Dozen**
13	**Catgut chromic gauge 6.0(2) 75cm on 35-37mm ½ circle round Bodied needle**	**Dozen**
14	**Catgut chromic gauge 6.5(3) 75cm on 50 mm ½ circle round Bodied Heavy needle**	**Dozen**
15	**Poly Dioxanone Monofilament gauge 3.0 (2/0), 90cm on 38-40 ½ Circle Round bodied needle.**	**Pk**
16	**Poly Dioxanone Monofilament gauge 3.5 (0),70cm on 25-27mm ½ Circle Round Bodied Needle.**	**Pk**
17	**Poly Dioxanone monofilament gauge 5.0(2) 90cm on 48-50mm ½ circle taper point heavy needle.**	**Pk**
18	**Polydioxanone monofilament gauge 3.0 (3/0), 75cm on 38-40 ½ circle round bodied needle**	**Dozen**
19	**Polyglycolic acid absorbable 2/0, braided Violet 75cm on 25-27 ½ circle reverse cutting needle**	**Dozen**

3. MEDICAL GASES

Medical Gases…

- **Definition**
  - A medical gas can be defined as any gas which is inhaled by a patient under the direction of a doctor for many purposes.

Medical Gases…

- A number of substances in gaseous state are administered by inhalation to achieve therapeutic effect, i.e. *anesthesia, analgesia, stimulation and maintenance of respiration and oxygen therapy*

- Medical gases are usually packed in metal cylinders designed to withstand high pressure

- Cylinders should be stored, handled and used in accordance with a strict code of practice (E.G. British standards institution)

Medical Gases…

Fig. metal cylinders

Medical Gases…

- Oxygen
- Carbon Dioxide
- Helium
- Nitrous Oxide
- Nitric Oxide
- Nitrogen
- Carbon Monoxide…

Medical Gases…

Oxygen (O_2)

- Chemical symbol: O_2
- Molecular Weight: 32
- Colorless, odorless, tasteless
- Slightly heavier than air
  - Density of 1.29 g/L
- Nonflammable but supports combustion

Oxygen (O_2)…

- Oxygen is used for a variety of purposes.
  - i. **During anaesthesia:** because a person's need for oxygen continues when he is an anesthetized
  - ii. **To relieve lack of oxygen in the tissue** which may be caused by:

A. Inadequate oxygenation of the blood by the lungs.

- ✓Pneumonia
- ✓Pulmonary edema
- ✓Post-operative pulmonary complications

Oxygen (O_2)...

B. Reduction of the circulating blood volume.

- Shock
- Coronary failure
- Collapse of the peripheral circulation

C. Reduction of the oxygen-caring capacity of the blood.

- Severe anemia
- CO- poisoning
- Cyanide poisoning

Oxygen (O_2)…

iii) **To increase radiation efficiency in tumor therapy.**

- Oxygenation of tumors sensitizes them to radiations.

Oxygen (O_2)…

Adverse effects

- **Respiratory depression**
  - (Symptom: Nausea, mood changes, vertigo, twitching, convulsion, and loss of consciousness)
- **Retinopathy of prematurity** occurs from excessive use of oxygen with neonates.

Assignment

- Other medical gases(medical gases other than oxygen)

Identification of medical gases

1.Color coding

- A color coding system is used for identification purpose
- In devising this system, the cylinder was divided into two parts, the **main body** and the **shoulder** at the valve end
- The latter part could be all the same color, or divided into quarters showing alternate colors

Identification of medical gases

- When a mixture of gases is in the cylinder, they are indicated by these alternating colors
  - ✓ I.e. mixtures of gases are indicated by alternating colors on the valve end of the cylinder, the body having the color of the main gas
- In addition, the chemical symbol of the gas is painted onto the cylinder

Details of the common gases are given below

Gas	Color		Pin index
	Body	**Valve end**	
Oxygen	Black	White	2:5
Nitrous oxide	Blue	Blue	3:5
Cyclopropane	Orange	Orange	3:6
Carbon dioxide	Grey	Grey	1:6
Ethylene	Violet	Violet	1:3
Helium	Brown	Brown	4:6
Nitrogen	Grey	Black	4:6
Oxygen / Carbon dioxide	Black	White/ Grey	2:6
Oxygen/ Helium	Black	White/ Brown	2:4
Oxygen/ Nitrous oxide	Blue	White/ Blue	3
Air	Grey	White/ Black	1:5

➢ ***Do NOT trust the color of the tank as sole indicator of it's contents***

2. Labels – The only sure way

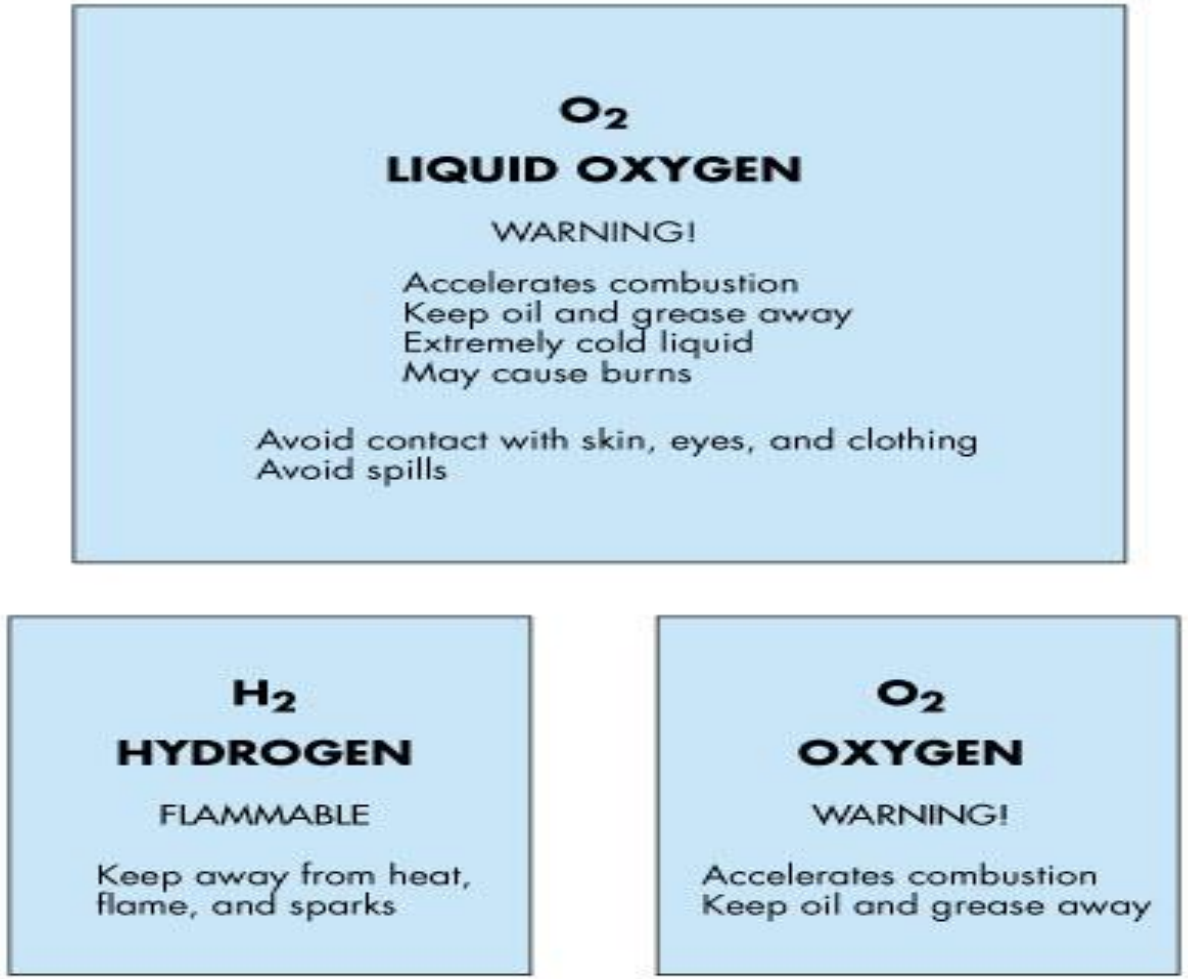


Figure 2-5 Example of gas labels. (Modified from McPhearson S: Respiratory care equipment, ed 5, St Louis, 1995, Mosby.)

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Safety precautions when using medical gases

- Medical gases are stored in heavy steel cylinders made to withstand **a pressure** of about 200 bars.

  - No gas is stored at a pressure greater than about 130 bars, therefore there is a safety factor about 70 bars.

- The cylinders are similar in **appearance**, and the possibility of confusion introduces a serious risk of administering the wrong gas.

Safety precautions...

- Each type of gas is given a color coding that readily identifies the cylinder.

NB - cylinders are very **heavy** and, unless supported during use, may fall, causing injury and damage.

Safety precautions...

Care of cylinders:

- ✓ Cylinders should be stored in a cool, well - ventilated room free from inflammable material.

- ✓ The room should be large enough for proper grouping according to the cylinder's contents, hence avoiding confusion.

Safety precautions...

Storage

- Avoid extreme heat or cold
- Avoid radiators
- Dry, clean, well ventilated
- Away from combustible materials (e.g. vapor rub, skin lotion, aerosol sprays)
- Away from sources of ignition

Safety precautions...

Leaks

- Listen for hissing noise
- Do not use sealing compounds on leaks
- Report a leak as soon as possible

Safety precautions...

Use of cylinders

- Handle with care , avoid knocks
- Ensure cylinder can not fall over
- Observe no smoking or naked lights
- Close cylinder as soon as therapy is complete
- Avoid long lengths of tubing especially on the floor
- When empty, close valve and replace cap

4. Other Medical Supplies

1. Endotracheal tube (Breathing tube), ETT

- Manufactured from non-toxic, non-irritant medical grade polyvinylchloride (PVC) compound.

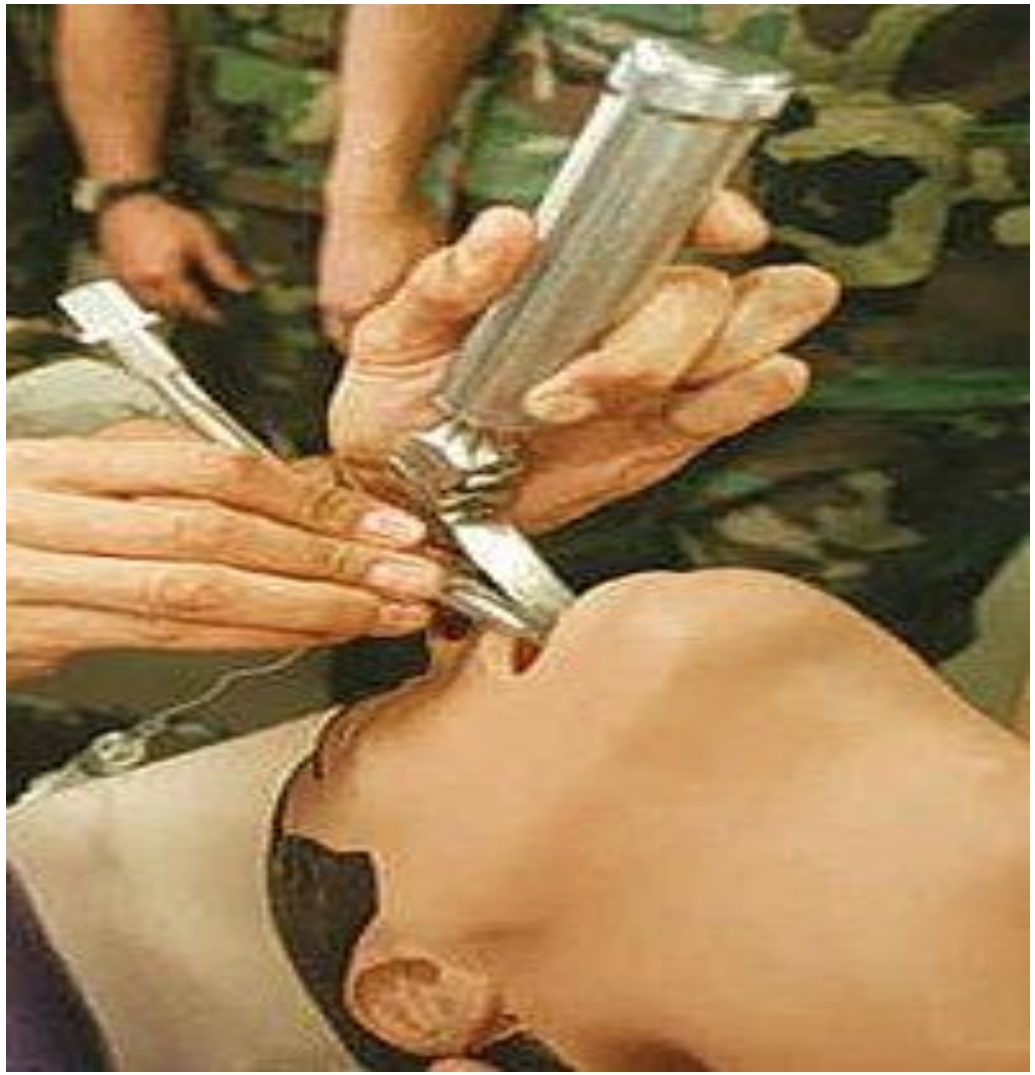
- Is used in **general anesthesia**, **intensive care unit** and **emergency medicine** for airway management, mechanical ventilation and as an alternative route for many drugs if an IV line cannot be established.

- The tube is inserted into a patient's trachea in order to ensure that the airway is not closed off and that air is able to reach the lungs.

Endotracheal tube…

Fig. Endotracheal tube

Endotracheal tube…



Insertion of the endotracheal tube:

- ✓ The ET tube is held in this practitioner's right hand and the laryngoscope is held in the left.
- ✓ The tube is inserted into the trachea, generally via the mouth, but sometimes through the nares of the nose (e.g. in extensive mouth surgery)

Endotracheal tube…

- The size is chosen based on the patient's body size, with the smaller size being used for pediatric and neonatal patients.

2. Nasogastric tube (NG tube)

- Clear plastic tube that passes through patient's nose and throat and ends in the patient's stomach.
- Are usually made of polyurethane or silicone.

Nasogastric tube …

- **NG** tube allows for direct "tube feeding" to maintain the nutritional status of the patient or removal of stomach contents.

- The main use of a NG tube is for *feeding* and for *administering drugs* and *other oral agents*.

Nasogastric tube…

- Nasogastric aspiration (suction) is the process of draining the stomach's contents via the tube.
- NG aspiration is mainly used to remove gastric secretions and swallowed air in patients with **gastrointestinal obstructions**.
- NG aspiration can also be used:
  - ✓In poisoning situations when a potentially toxic liquid has been ingested
  - ✓For preparation before surgery under anesthesia
  - ✓To extract samples of gastric liquid for analysis.

Nasogastric tube…

- Tubes of various sizes have been used
- The selection of an appropriate size is largely dependent on the age, the intended use for the tube and the anticipated duration it will be in situ.
  - ✓Infant/Child: 10-14 Fr
  - ✓Adult: 14-18 Fr

Nasogastric tube…

- **Soft, flexible, small-diameter** (8 Fr to 12 Fr) tubes are frequently used for patients who require enteral feeding for up to 6 weeks.

- However **firmer, less flexible, large-diameter tubes** (14 Fr or larger) are used to administer medications, and for short term feeding (usually shorter than 1 week).

Nasogastric tube…

Fig. A malnourished child with a feeding tube

3. Rectal tube

- A rectal tube is made of PVC and used to expel flatus from the rectum.
- The clear rectal tube is disposable.
- Size (Fr.) 18, 20, 22, 24, 26, 28, 30, 32

4) Intravenous Cannula

- An **intravenous cannula** is a flexible tube which when inserted into the body is used either to **withdraw fluid** or **administer medication**.

Intravenous cannula

Intravenous Cannula…

- Cannula normally come with a **trocar** (a sharp pointed needle) attached which allows **puncture** of the body to get into the intended space.

Intravenous Cannula…

- *Commonly used sizes*

Guage	Indication
18G	Blood transfusion
20G	Labor
22G	Medication
24G	Infant/ child
26G	Neonate

5. Catheter

- A **catheter** is a tube that can be inserted into a body cavity, duct or vessel to allow drainage/injection of fluids or access by surgical instruments.
- **Uses**: Placement of a catheter into a particular part of the body may allow:
  - ✓ Draining urine from the urinary bladder (**Foley catheters**)
  - ✓ Drainage of urine from the kidney by percutaneous (**nephrostomy**)
  - ✓ Drainage of fluid collection, e.g. an abdominal abscess

Catheter…

- A range of polymers are used for the construction of catheters including silicone, rubber latex and thermoplastic elastomers.
- Silicone is one of the most common choices because it is inert and unreactive to body fluids and a range of medical fluids with which it might come into contact.

Catheter…

A catheter installed for a male doll in an exercise.

Catheter…

- Catheter diameters are sized by the French catheter scale (F).
- The most common sizes are 10 F (3.3mm) to 28 F (9.3mm).
- The clinician selects a size large enough to allow free flow of urine, and large enough to control leakage of urine around the catheter.

Catheter…

- ✓ A larger size can become necessary when the urine is **thick**, **bloody** or **contains large amounts of sediment**.
  - ➢ More likely to cause damage to the urethra.
- ➢ Some people develop allergies or sensitivities to latex after long-term latex catheter use making it necessary to use silicone or Teflon types.
- ➢ **Silver** alloy coated urinary catheters may **reduce infections**

Catheter types:

- **Foley catheter:** retained by means of a balloon at the tip which is inflated with sterile water.

Catheter types…

- **Robinson catheter**: flexible catheter used for short term drainage of urine.
  - Unlike foley catheter, it has no balloon on its tip and hence can't stay in place unaided.

Catheter types…

- **Coude catheter:** designed with a curved tip that makes it easier to thread the catheter pass the prostate or obstructions in the urethral canal.
- A coude catheter tip may be provided with a balloon or not

Catheter types…

- **Irrigation catheter**: has a **separate lumen** to carry irrigation fluid into the bladder.
- This is useful following endoscopic surgical procedures or in the case of gross hematuria.

Catheter types:

Foley catheters

- Are flexible (usually latex) tubes that are passed through the urethra during urinary catheterization and into the bladder to drain urine.
- They are retained by means of a balloon at the tip which is inflated with sterile water.
- The balloon typically come in two different sizes: 5cc and 30 cc.
- ✓ They are commonly made in silicone rubber or natural rubber.

Catheter…

- Foley catheters are used during the following situations:
  - ✓On patients who are anesthesized or sedated for surgery or other medical care
  - ✓On comatose patients
  - ✓On some incontinent patients
  - ✓On patients with acute urinary retention
  - ✓On patients who are unable due to paralysis or physical injury to use either standard toilet facilities or urinals.
  - ✓Following urethral surgeries

Catheter…

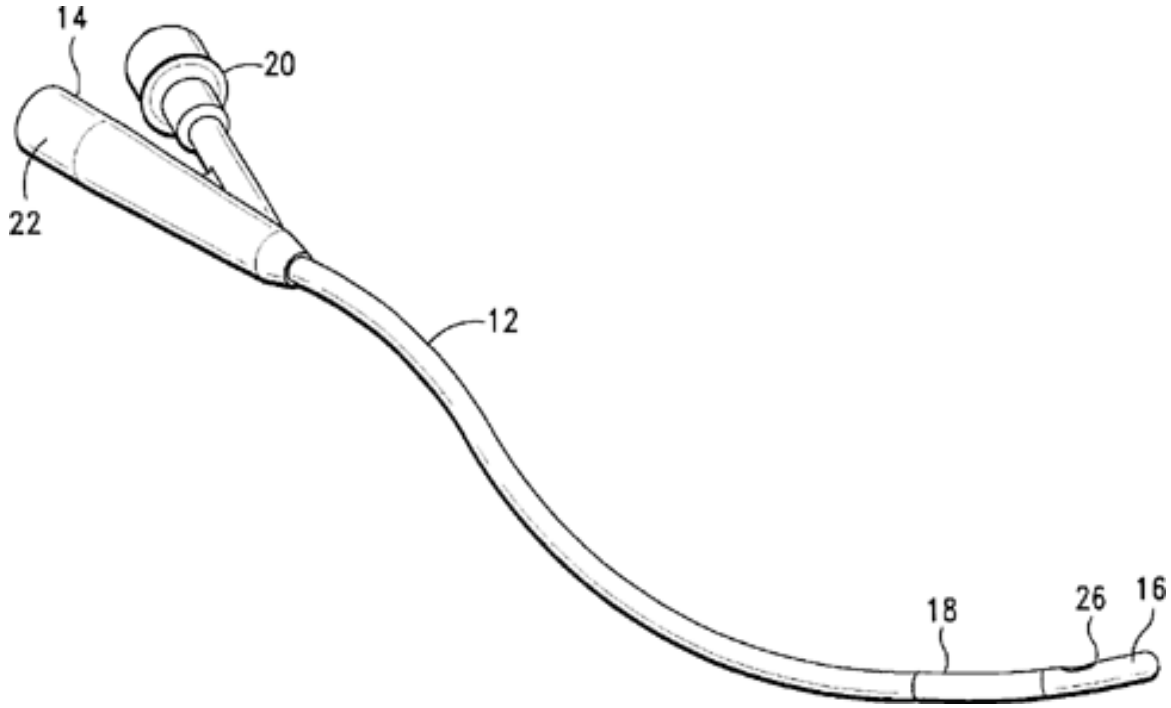
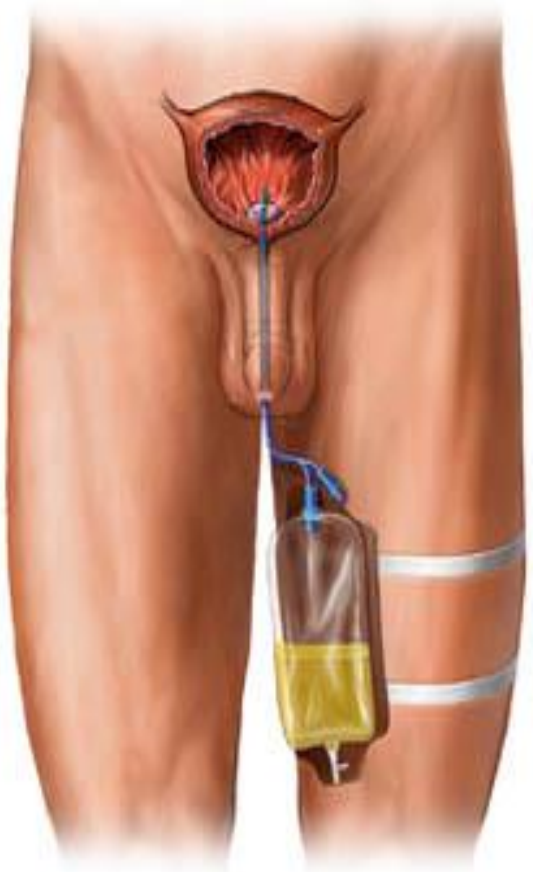


Diagram of a foley catheter

Catheter…

Foley catheter



6) Colostomy bag

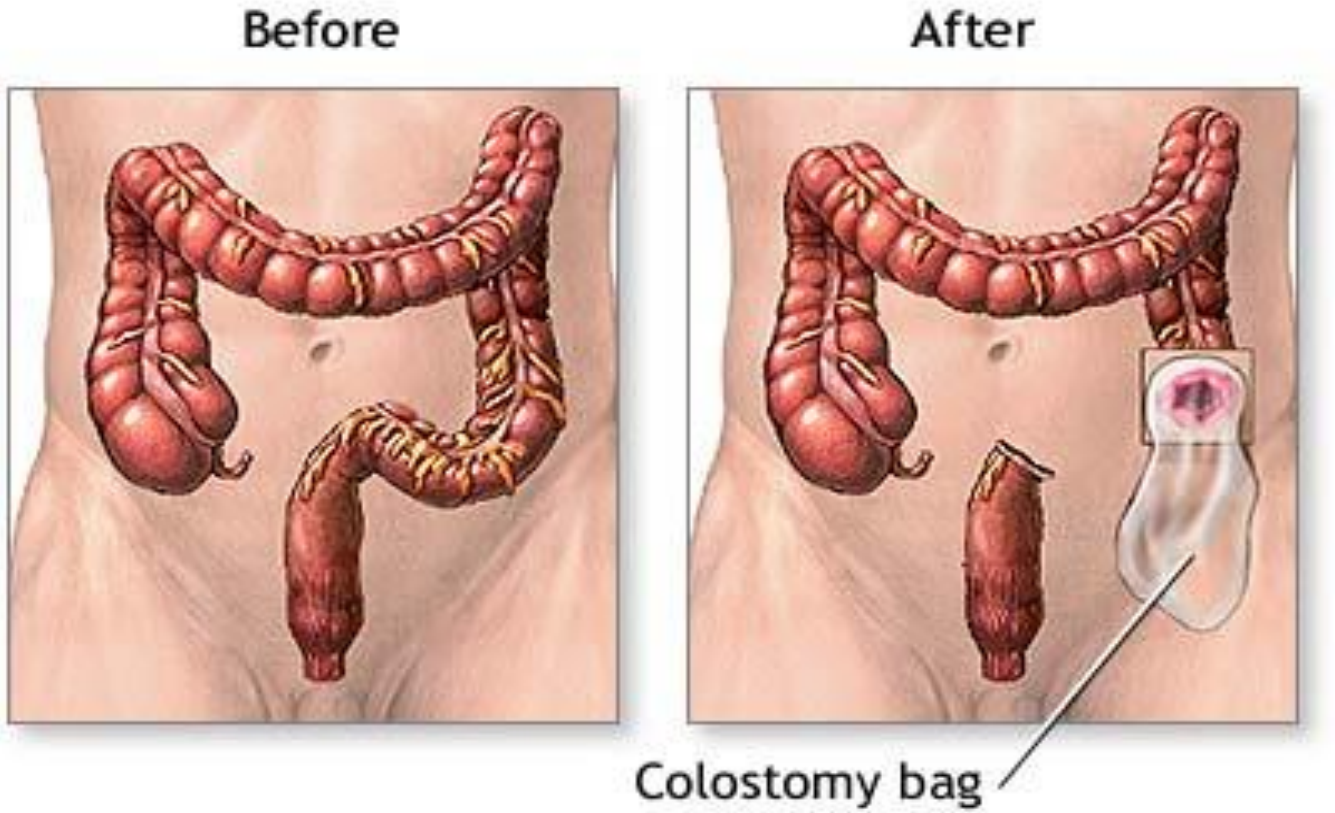
- Colostomy refers to a surgical procedure where a portion of the large intestine is brought through the abdominal wall to carry stool out of the body.

- Colostomy bag is used to collect stool after colostomy.

Colostomy bag…

colostomy

Colostomy bag…



Colostomy bag…

Colostomy bag

7. Tourniquet

- Is elastic reusable, non-sterile strip used to facilitate the puncture of veins
- Length: 75-100 cm
- Must be cleaned and disinfected as often as necessary.
- Types of tourniquet
  - For adult
  - For child

Tourniquet...

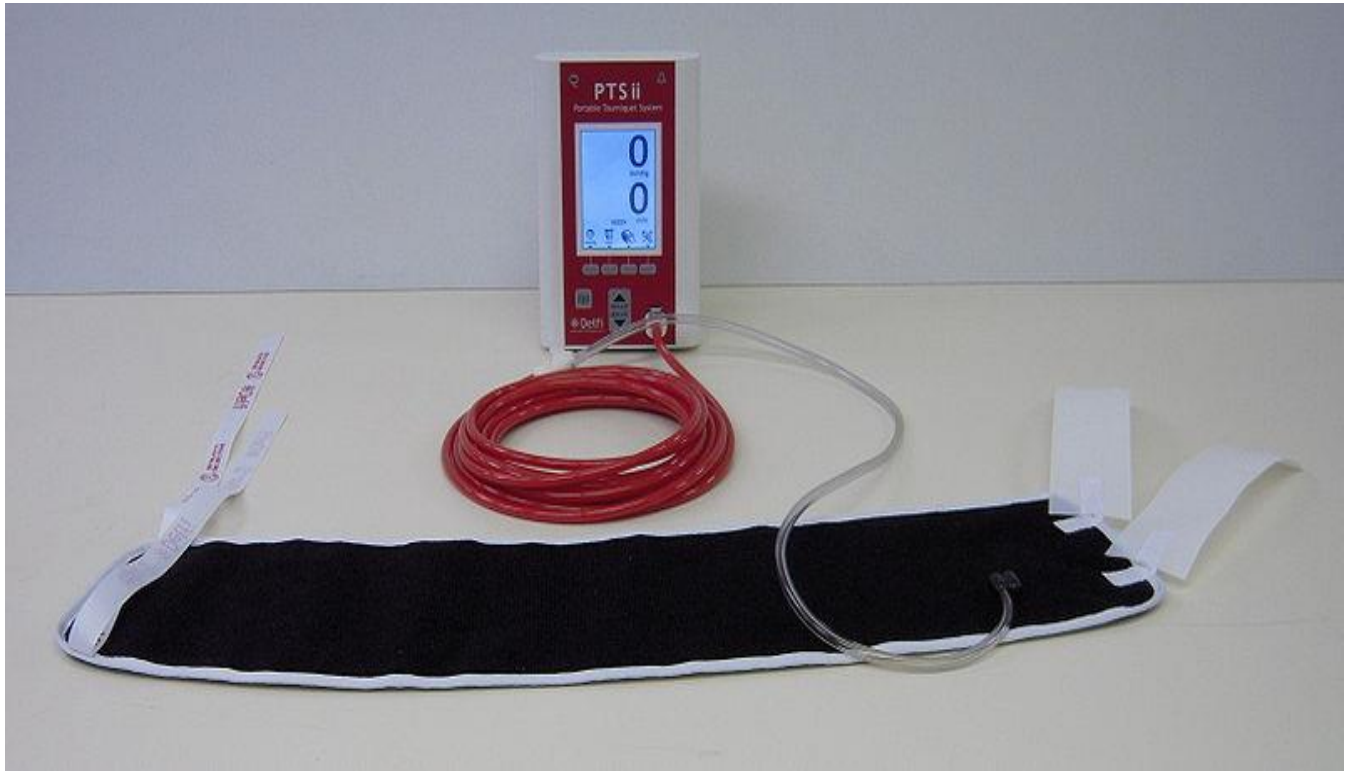
The tourniquet

Tourniquet…

Rubber type

Latex type

Tourniquet…



Modern tourniquet system attached to a modern wide contour cuff

8. Tongue depressor

- A **tongue depressor** is a device used in medical practice to depress the tongue to allow for examination of the mouth and throat.

- The most common modern tongue depressors have thin wooden blade, smoothed and rounded at both ends, but historically tongue depressors have been made of a variety of materials.

- Since they are inexpensive and difficult to clean, wooden tongue depressors are normally labeled for disposal after a single use.
- Tongue depressors are available for adults and infants.

Tongue depressor…

Tongue Depressor

9. Kidney dish

- A kidney dish is a **kidney- shaped bowl** used in **medical and surgical** wards to receive soiled dressings and other medical waste.

- Reusable dishes are made from stainless steel, while disposable ones may be made from paper bulb or plastic.

Kidney dish…

Fig. Kidney dishes

10.Urine drainage bag

- Used for short and long term drainage of urine. Sizes vary depending patients' age.

11. X-ray supplies

- X-ray films – capture image
- X-ray cassettes – hold films
- X-ray intensifying screens – intensify image

Sizes

- 35cm x 35cm
- 40cm x 30cm
- 24cm x 30cm
- 18cm x 24cm

- In digital x-ray machines (no need of such supplies)
- X-ray chemicals: Barium sulphate, Urographin, developer, fixer.

12. Needles:

- Hypodermic needle is a hollow needle commonly used with a syringe to inject substances into the body.
- They may also be used to extract body fluids like blood from veins.
- Needles can be made of stainless steel, chromium, platinum, silver, gold etc…

- **Hypodermic needles are characterized by:**

1. **Gauge:** refers to the outside diameter of the cannula (needle shaft)
    - The gauge is given in number and the larger the number, the smaller the diameter.
    - The usual range of gauges in common use range from 13 (largest diameter) to 27 gauge.
    - Subcutaneous injection usually requires 24/25 gauges while intramuscular requires 19 to 22 gauges.

2. Needle length: refers to the length of the needle shaft (starting from where the cannula joins the hub) & usually ranges from 0.25 to 3.5 inches.

3. Bevel: refers to the slanting cutting edge which has a tapering point/tip. The bevel facilitates penetration and injection through tissue or rubber closures.

- Needles are designed for variety of purposes and some factors are to be considered during their selection among which safety, rate of flow, comfort of patients and depth of penetration are the major.
  - Local anesthesia use – 26 to 20 G
  - SC use 24 to 25 G
  - IM use 19 to 22 G
  - IV use 15 to 25 G
  - Children use – rarely exceed 22 G

13.Syringes:

- Syringes are medical supplies intended for installation of liquids in to the body or its cavities or to withdraw body fluids from the body cavities like the blood vessels and other organs or tissues.
- As per their principles of actions, they are classified in to two:
  - Plunger/hypodermic syringes
  - Bulb syringes

- **Hypodermic syringes:**
  - A hypodermic syringe is a simple **piston pump** consisting of a plunger that fits tightly in a tube.
  - The plunger can be pulled or pushed along the inside of the cylindrical tube (the barrel) allowing the syringes to take in and expel a liquid or gas through an orifice at the open end of the tube.
  - Syringes are fitted with **hypodermic needles**, a nozzle or tubing to help direct the flow in to and out of the barrel.
  - They are **often used to** administer injections, apply compounds such as glue or lubricant and measure liquids.

- The barrel of a syringe is made up of a graduated, transparent **plastic or glass** material.
- Medical syringes are some times used without a needle for orally administered liquid medicines to young children or animals or milk to younger animals.
- Most modern medical syringes are plastic with a rubber piston
  - Seals much better b/n piston & barrel
  - Cheap enough to dispose of after being used only once

Bulb syringes:

- Such syringes are frequently preferred when sterility is not required and plunger type syringes are dangerous to use because of their force.
- Particularly important in nose and ear and urinary irrigation.
- Are one piece molded bulbs of soft, flexible rubber with long and narrow nozzles employed in treating the eye, ear, nose and also for irrigation of any open cavity like rectum and vagina.

14.Gloves:

- These are medical supplies that provide an effective physical barrier for hands from the micro-flora associated with patient care.
- Worn when health workers contact with any secretion or excretion of the patient and must be discarded after each patient care contact.
- Gloves can be **examination or surgical** and commonly vary from number 6-8 sizes
- Can be made from latex or from other synthetic polymers

- Latex gloves are often preferred over vinyl gloves because of operator comfort and but some allergic reactions have been reported with latex gloves.

Synthetic polymers

- polyisoprene
- Neoprene glove
- Nitrile glove
  - ✓ Less comfortable
  - ✓ Less flexible
  - ✓ More expensive

- **Lubricants of gloves**
  - Gloves may be powdered (lubricated) or non-lubricated
  - Lubricants: talc, zinc oxide, corn starch
  - Lubricants facilitate to put gloves on hands
  - No lubricant is recommended for surgical gloves.

15.Oxygen mask

- Used for convenient oxygen administration
- Tube is provided with connectors at both ends for easy connection with Oxygen source.

End of the Note.

Thank You!!!